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10 CLAIMS

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1. An optical amplifier comprising:
an optical waveguide structure through which signal light and pump light
20 are propagated, said optical waveguide structure having a core with a
relatively high refractive index and a clad with a relatively low refractive
index, at least said core exhibiting a nonlinear response of second or third
order, to thereby achieve optical parametric amplification of said signal
light; and
25 separate idler light filter means (5) for attenuating idler light, which is
generated in the process of optical parametric amplification, said idler light
filter means being placed in said optical waveguide structure at a defined
length L_{\max} .
- 30 2. Optical amplifier according to claim 1 where the length L_{\max} is defined by
the difference between power of the pump wave and the signal wave, the
gain factor of the waveguide, the absorption of the waveguide.

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3. Optical amplifier according to claim 1 where the length L_{\max} is

$$5 \quad L_{\text{eff max}} = \frac{P_{po}(\text{dB}) - P_{so}(\text{dB}) + 3}{\frac{10}{\ln(10)} 2g - \alpha(\text{dB/km})}$$

P_{po} is pump power, (dB) in logarithmic units

$g^2 = (\gamma P_{po}(\text{W}))^2 - (\kappa/2)^2$ is the gain coefficient

γ is waveguide nonlinear coefficient

10 κ is the phase matching term

α is waveguide attenuation

15 4. Optical amplifier according to claim 1 where the filter reduced at least 50% of the power of idler wave.